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MUD-FLUID MATERIALS IN EASTERN ILLINOIS

By J. E. Lamar

Introduction

For some years certain Illinois oil-well operators have filled the space between the casing and wall of some of their wells with mud-fluid in order either to prevent corrosion of the casing or to shut off water from horizons above the oil-bearing sand. Subsequent attempts to pull the casing in some of the mudded wells have revealed that it was "frozen," for which the reason has been rarely determined. In many cases the "freezing" may be the result of having used a thin mud-fluid containing a considerable quantity of sand and silt which settled to the bottom, there formed a tight packing between the wall of the well and the casing, and by wedge action or great friction against the casing resisted its withdrawal. If this explanation be correct the "freezing" of casing could be prevented in many wells by using a mud-fluid free from sand and silt.

The current low price of crude-oil and proration of oil production will undoubtedly force a considerable number of wells now producing to shut down. In order to preserve them with little or no damage until conditions again warrant their operation, it is proposed by some to plug them temporarily with mud-fluid, partly or wholly filling them, and introducing at least a quantity sufficient to create and maintain a slight back-pressure on the sand. It is anticipated that the mud may penetrate a short distance into the sand itself, so that in effect it will constitute an integral part of the sand and reduce to a minimum those movements of oil and water normally induced by drainage to the well.

Because the use of mud-fluid plugs is new in Illinois oil-fields, little is known concerning the most suitable type, the most desirable consistency, and the effect of sand and silt. However, inasmuch as an impervious plug is desired, the use of a thin mud-fluid containing much sand, which might

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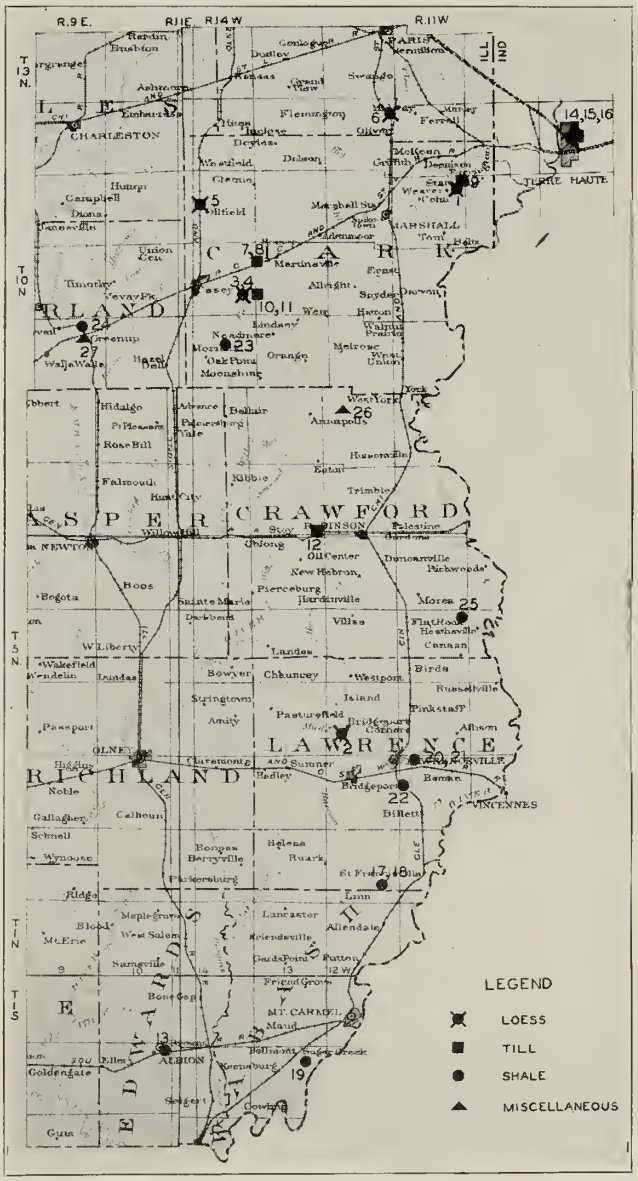

FIG. 1. Index map showing locations of samples which were tested (Table 1).

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settle to the bottom of the well cavity and form a relatively porous layer, does not appear advisable. Other features of mechanical composition may prove to be important after mud-fluid plugs have been in actual use for a time. Therefore the character of the raw material from which a mud-fluid is made and consequently the general character of the fluid should be known at least in a general way in order that subsequent action may be properly interpreted and most completely understood.

In order to ascertain (1) which earth materials in the eastern Illinois oil-fields have the highest clay content and are therefore best suited for mud-fluids used outside the casing of wells, and (2) the mechanical composition of earth materials likely to be used for temporary plugs, a series of samples were obtained from Edgar, Clark, Crawford, Lawrence, and Wabash counties (fig. 1) and tested for clay content (Table 1).

The mechanical analyses followed the generally accepted classification of earth materials, according to which clay consists of particles less than 1/256 millimeter or 0.00015 inch in size. The clay particles are so small that they remain long in suspension in water and thus may be separated from the coarser sediments which settle more rapidly. Experiments and microscopic measurements have shown that material which settles a distance of less than 3 inches in 25 minutes is composed largely of clay grains.

Mr. Charles R. Clark, of the State Geological Survey, collected and made mechanical analyses of most of the samples reported upon herein, and Mr. E. T. Benson, also of the Survey, secured a number of additional samples.

Earth Materials Available for Mud-fluids

In the eastern Illinois oil-fields the three principal types of earth materials that will serve as sources of mud-fluids are (1) loess, (2) glacial till, and (3) the shales and clays of the Pennsylvanian (Coal Measures) formations.

Loess.—The loess is a gritty clay, usually brown in color and locally sandy. It is free from pebbles except 20 or 30 miles inland from Kaskaskia and Wabash rivers where it may contain scattered small pebbles. It constitutes the surface material over the greater part of the eastern Illinois oil-fields and has been blown up from the bottom lands along Kaskaskia and Wabash rivers. Near the rivers the loess has a maximum thickness of about 10 feet, but thins to 2 or 3 feet about 20 miles to the west. Because it is readily converted into mud by the addition of water and moderate mechanical agitation, it probably has been the most common source of clay for mud-fluids.

Till.—The glacial till is a gray or buff, pebbly and cobbly clay that was deposited at the time of melting of the great continental ice sheet which spread from Canada over northern United States. Till is widespread in the

eastern Illinois oil-fields but is generally overlain by loess, so that it is usually exposed only along the banks or bluffs of streams where erosion is active. Usually it is quite firm and at some places is known as "hardpan." Originally it contains calcium carbonate which leaches out by weathering.

Shale and clay.—The Pennsylvanian (Coal Measures) shales and clays are bedrock formations and crop out at relatively few places. The shales vary greatly in character, some being quite free from sand and silt, others being very silty and sandy. Their color is usually gray or dark gray. The clays, commonly called "fireclays" but more properly termed "underclays," are found immediately beneath coal beds or at horizons where the associated coal beds are locally absent. The underclays are usually light gray or gray in color and vary greatly as to their sand and silt content. The outcrops of some of the shales may weather to clay but the true character of the deposit is revealed if the weathered portion is removed.

Other clays.—All other clayey sediments in eastern Illinois, as for example the alluvium in the floodplains of streams, are mixtures of materials derived probably from deposits of loess, till, or Pennsylvanian (Coal Measures) rocks.

Adaptability of Earth Materials for Making Mud-fluids

Loess.—According to analyses (Table 1), five samples of loess, three from Clark, one from Lawrence, and one from Edgar County (fig. 1), contain from 57 to 65 and average about 62 per cent clay, which is only slightly lower than the average clay content of the shales and is considerably higher than that of the till. Therefore, a mud-fluid made from the loess would contain 35 to 45 per cent of sand and silt, and if introduced between the casing and wall of a well, this proportion of sand and silt might have an important bearing on the possible "freezing" of casing. The value of a mud-fluid made directly from loess, as a temporary plug, is not known. However, from the standpoint of ease of preparation and comparatively high clay content, loess appears to be generally the best material available in eastern Illinois.

Various devices for "refining" or eliminating some of the sand and silt have been tried usually with indifferent or only fair success. One attempt raised the clay content from 57.2 per cent in the "unrefined" loess to 64.6 per cent, or 7.4 per cent (analyses 3 and 4, Table 1). It seems likely that a process which would materially better this figure might be developed.

Till.—In six samples of glacial till, five from Clark and one from Crawford County (fig. 1), the clay content ranges from 33 to 61 per cent and averages 42 per cent (Table 1). The preparation of a suitable mud-fluid from glacial till, for mudding outside the casing of a well, is more difficult than from loess, at least with methods now used, because the till con-

sists of a heterogeneous mixture of clay with silt, sand, pebbles, cobbles, and boulders which are relatively difficult to separate from the clay. As a source of oil-field mud-fluids it is also probably less desirable than the loess because it generally has a lower clay content. Till with the cobbles and boulders removed may be a satisfactory temporary plug, although cleaning out such a well might be somewhat troublesome.

Shale and clay.—The clay content of 13 samples of Pennsylvanian shales and clays varies widely, from 50 per cent to 98 per cent, and averages almost 68 per cent (Table 1). Nine of the 13 samples were obtained from exposures in eastern Illinois (fig. 1). Of the four remaining samples three were taken from the pits of the Vigo Brick Company at Terre Haute, Indiana, and one from the Albion Brick Company at Albion, Illinois, in order to determine the character of the material available from commercial clay producers in the eastern Illinois oil-field region.

The clays and shales are more tenaceous and difficult to break down to a mud than are either the loess or the glacial till. Probably most of them will have to be crushed and ground, mixed with water, and thoroughly agitated before they can be used for mud-fluids, and even then considerable difficulty may be caused by small unbroken clay pellets having a siliceous cement which will act like sand grains. The necessity of crushing and pulverizing also handicaps their use as temporary plugs. The use of Pennsylvanian shales and clays therefore is likely to involve a considerable labor expense, and as the outcrops of these materials are limited they would have to be transported appreciable distances to reach most of the wells. However, the high clay content of some of the clays may warrant their economical exploitation as a source of raw material for high-clay mud-fluids, despite the cost of preparation.

TABLE I.—*Tests on Oil-field Clay, Shales, and Muds*

Sample Number	Location	Per cent clay	Remarks
	LOESS		
1	Road cut along State road, SW. ¼ sec. 1, T. 11 N., R. 11 W., Clark Co.	60.4	
2	NW. ¼ sec. 29, T. 4 N., R. 12 W., Lawrence Co.	65.4	Mud used in Bowers and Ross well No. 19.
3	NW. ¼ sec. 25, T. 10 N., R. 14 W., Clark Co.	64.6	"Refined" mud used in Davis well No. 1.
4	NW. ¼ sec. 25, T. 10 N., R. 14 W., Clark Co.	57.2	Loess used as source of "refined" mud used in Davis well No. 1.

Sample Number	Location	Per cent clay	Remarks
5	Road cut at cross-roads east of Oilfield, S. center sec. 17, T. 11 N., R. 14 W., Clark Co.	63.9	
6	Excavation on J. D. Baker farm. NE. ¼ sec. 12, T. 12 N., R. 12 W., Edgar Co.	61.9	Sample from 3 feet of loess like clay formerly used for making tile. Overlain by 2 feet of loess.
	GLACIAL TILL		
7	Road cut 1½ miles west of Martinsville, SW. ¼ sec. 7, T. 10 N., R. 13 W., Clark Co.	43.0	Buff till, upper 15 feet of cut.
8	Road cut 1½ miles west of Martinsville, SW. ¼ sec. 7, T. 10 N., R. 13 W., Clark Co.	33.5	Gray till, lower 20 feet of cut.
9	Road cut along State road, SW. ¼ sec. 1, T. 11 N., R. 11 W., Clark Co.	39.4	Unleached gray till.
10	Creek bank near road, NW. ¼ sec. 30, T. 10 N., R. 13 W., Clark Co.	37.1	Unleached till.
11	Creek bank near road, NW. ¼ sec. 30, T. 10 N., R. 13 W., Clark Co.	61.1	Leached till.
12	Cut along road, SW. ¼, SE. ¼, SW. ¼, sec. 36, T. 7 N., R. 13 W., 1¼ miles east of Stoy. Crawford Co.	39.2	7-16 feet of unleached till.
	SHALE		
13	Albion Brick Co. pit, Albion, Illinois, Edwards Co.	69.6	Gray shale in bottom of pit, 7 feet exposed.
14	Vigo Brick Co. (American Plant) pit, Terre Haute, Ind. Plant south of highway.	56.7	Gray shale or underclay just below coal.
15	Vigo Brick Company, Terre Haute, Ind. Plant north of highway.	86.1	Gray shale just above coal.
16	Vigo Brick Company (American Plant) pit, Terre Haute, Ind. Plant south of highway.	76.7	Gray shale above coal.
17	In bank of Racoon Creek, S. center sec. 26, T. 2 N., R. 12 W., Wabash Co.	69.3	Gray-brown shale below "roofing slate."
18	In bank of Racoon Creek, S. center sec. 26, T. 2 N., R. 12 W., Wabash Co.	51.6	Gray-brown shale above "roofing slate."

Sample Number	Location	Per cent clay	Remarks
19	In bank of Coffee Creek, 300 yards east of Rochester road, NW. ¼ sec. 11, T. 2 S., R. 13 W., Wabash Co.	50.4	Underclay below carbonaceous shale.
20	Embarrass river bank north of old bridge, NW. ¼ sec. 5, T. 3 N., R. 11 W., Lawrence Co.	73.9	Gray-brown shale, 3 feet thick, above "slaty" shale.
21	Embarrass river bank north of old bridge, NW. ¼ sec. 5, T. 3 N., R. 11 W., Lawrence Co.	62.7	Gray shale, 3 feet thick, below "slaty" shale.
22	South bank Indiana Creek. Center W. ½ sec. 18, T. 3 N., R. 11 W., Lawrence Co.	65.2	Gray shale, 3 feet thick, below carbonaceous seam.
23	Creek bank, W. J. Hullenel farm, sec. 15, T. 9 N., R. 14 W., Clark Co.	52.6	Gray clay below coal.
24	Cut along Toledo road ½ mile north of Greenup, SW. ¼ sec. 2, T. 9 N., R. 9 E., Cumberland Co.	68.2	Gray shale.
25	Creek bank, SW. ¼, SE. ¼, sec. 1, T. 5 N., R. 11 W., Crawford Co.	98.4	Dark gray shale, 3 feet exposed.
	MISCELLANEOUS		
26	Along creek, NE. ¼, NW. ¼, NW. ¼ sec. 8, T. 8 N., R. 12 W., Crawford County.	23	Clayey sand, 2½ feet, exposed.
27	Base of cut near light plant and I. C. depot, Greenup, Cumberland Co.	59.9	Brown clay.

PETROLEUM DEVELOPMENTS IN ILLINOIS IN 1929 AND 1930

By Alfred H. Bell and E. T. Benson

Summary

The year 1929 was one of continued activity in the petroleum industry of Illinois but new production was insufficient to offset the decline in the production of the old wells (Table 2). Drilling costs did not change materially during the year and the prices of crude oil increased slightly, so that the prospects for further testing were good at the end of the year. The total number of completions in Illinois in 1929 was greater than for any year since 1917. More than half of these were in the Dupo field, St. Clair County, of which the development was largely responsible for the increased ratio of producers to dry holes in the State as a whole. In the southeastern Illinois field, which has produced about 97 per cent of the State's petroleum, the number of completions was greater than in 1928 and the percentage of producers was a little higher. Although a number of scattered wildcat tests were drilled, most of them were not located on favorable structure and the only noteworthy discovery was that of a shale-gas horizon at shallow depth in Morgan County (western Illinois) where gas has been produced for a number of years from sandstone and limestone.

In 1930 widespread adverse economic conditions in the oil industry were reflected in Illinois by 9.8 per cent decrease in the annual production from that of 1929 (Table 2) and by a marked decrease in the number of wells drilled (Table 4). Approximately seven-eighths of the decrease in production is the result of the 25 per cent curtailment, effective September first, according to the agreement of the southeastern Illinois operators.

Of the total number of wells drilled during 1930 in Illinois, 197 holes were drilled on or close to proved territory, and 56 were wildcats. Of these 56 wildcats, only seven were located by geologists. No important new pools nor new producing formations were discovered in 1930. Few of the wildcat wells drilled were favorably located with respect to geologic structure. Unless there is a substantial increase in crude oil prices it is unlikely that there will be any marked revival in drilling activity during 1931. If there is no change in the present proration agreement it is estimated that Illinois will produce about 5 million barrels of oil in 1931.

Southwestern Illinois

ST. CLAIR COUNTY

Dupo Field.[1] During the spring and summer of 1929 more than 200 wells, with initial productions ranging from 50 to 350 barrels, were drilled

[1] Bell, Alfred H., The Dupo oilfield: Illinois State Geol. Survey, Illinois Petroleum No. 17, March 2, 1929.

in the Dupo field, 7 miles south of St. Louis, Missouri. About 160 of the new wells were drilled on town lots in Dupo, which occupies about 130 acres and constitutes about 20 per cent of the probable area of the pool as now outlined. Owing to their close spacing, production in these wells declined very rapidly, and a number of them were soon abandoned. In other parts of the field production was reported to be holding up satisfactorily. In 1930 the Dupo field again contributed more new production than any other field in the State, but the proved area was not extended.

The oil in the Dupo field comes from the upper part of the Kimmswick (Ordovician) limestone, the top of which is reached at depths ranging from 400 feet in the Mississippi River bottoms to more than 700 feet on the upland east of the bluffs. The Dupo field is located on the northern extension of the Waterloo anticline[2] which trends a little west of north and is about 18 miles long. Near Dupo the structure is a pronounced asymmetrical anticline having a steep westward dip (maximum observed 32°) and a low eastward dip (about 2°), but it plunges to the north and dies out near the center of the city of St. Louis.

The proved area of the Dupo field is about two miles long and half a mile wide, embracing about 640 acres. About one mile north of the north edge of the productive area in Dupo two small wells gave initial productions of 5 to 10 barrels, and in East Carondelet, two miles northwest of Dupo, three or four small oil-wells were obtained, one of which gave a considerable quantity of gas. None of these wells was producing at the end of 1929. Toward the south end of the Dupo field a number of wells were drilled late in 1929, chiefly in the SW. ¼ sec. 34, T. 1 N., R. 10 W. The most southerly producer was in the NW. cor. NE. ¼ sec. 3, T. 1 S., R. 10 W., and had an initial production of 25 barrels, which is considerably less than that of the wells farther north. The southern limit of the field is probably not far south of this well, as several dry holes were drilled farther south in secs. 2, 3, and 10.

Most of the 48 dry holes drilled in St. Clair County in 1929 and 1930 were located in the Dupo area on the flanks of the anticline, too low on the structure to obtain production. Those that penetrated the Kimmswick formation encountered salt water in it. A few were drilled deeper into the underlying Prairie du Chien series.

Darmstadt anticline.[3]—The Darmstadt anticline, about 20 miles southeast of Dupo, is known from data provided by coal tests and is a much less pronounced structure than the Waterloo anticline. Shallow drilling to determine detailed structure in this area was begun in October, 1929, and

[2] Mylius, L. A., Geology and oil and gas possibilities in the vicinity of Waterloo, Illinois State Geol. Survey, Press Bulletin.
Lamar, J. E., Notes on the Waterloo anticline, Illinois State Geol. Survey, Press Bulletin.

[3] Bell, Alfred H., The Darmstadt anticline and related structures, St. Clair County, Illinois State Geological Survey, Illinois Petroleum No. 18, Nov. 2, 1929.

continued in 1930. One deep test, the Ohio Oil Company Koch No. 1, which penetrated the Kimmswick formation without success, was drilled in 1930. A gas well reported to have an initial rock pressure of 300 lbs. to the square inch was drilled in 1929 on a small structure just east of the Darmstadt anticline.

MONROE COUNTY

In the Waterloo field, which began producing in 1921, the properties of the Ohio Oil Company were abandoned in 1929 because of the decline in production.

Near Renault a wildcat well in sec. 36, T. 4 S., R. 10 W., was drilled in 1929 and penetrated the Kimmswick ("Trenton") limestone with a total depth 600 feet without striking oil. Another test east of Redbud in sec. 36, T. 3 S., R. 8 W., begun in 1929 and completed in 1930, was also a dry hole in the Kimmswick formation. Neither well was located on known favorable structure.

RANDOLPH COUNTY

Northeast of the Sparta gas field,[4] which is now inactive, a well drilled in 1929 in sec. 26, T. 4 S., R. 5 W., was a dry hole in the Sparta (Cypress or Yankeetown) sand at a total depth of 1130 feet. Another well drilled in 1929 in sec. 30, T. 4 S., R. 7 W., was a dry hole in the Kimmswick formation. Neither well was located on known favorable structure. South and west of Sparta, in sec. 26, T. 5 S., R. 6 W., a 1929 test on a small structure in the Pennsylvanian formations was a dry hole in the Lower Mississippian limestone, with a total depth of 1,325 feet.

PERRY COUNTY

At Denny a test of the Pennsylvanian and Chester formations was being drilled at the close of 1930. Several wells were drilled close to Denny twenty years ago, and one is reported to have shown considerable oil in a Chester sandstone, probably the Yankeetown formation. Reports on two areas of favorable structure in Perry County studied by the Illinois State Geological Survey in 1930 have been recently published.[5]

MADISON COUNTY

Two small oil wells completed in 1930 in the Mississippi River bottoms west of Collinsville might encourage further development if conditions in the oil industry improve. The better of the two pumped from the upper part of the Devonian-Silurian ("Niagaran") limestone 14 barrels of crude

[4] Moulton, Gail F., Oil and gas possibilities near Sparta, Illinois State Geol. Survey Illinois Petroleum No. 1, April 17, 1926.

[5] Bell, Alfred H., Ball, C., and McCabe, L., Geology of the Pinckneyville and Jamestown areas, Perry County, Illinois, Illinois State Geol. Survey Illinois Petroleum No. 19, April 11, 1931.

oil the first ten hours. On the same farm are several abandoned wells which were pumped many years ago.

MACOUPIN COUNTY

Seven of the old wells in the Staunton gas pool were deepened in 1930 to an oil-sand about 30 feet beneath the gas horizon,[6] but only two have shown enough oil to make producers and they have not been pumped consistently, so their true potential is unknown. The formations associated with the oil horizon are irregular and in few of the wells is the oil found at exactly the same horizon.

Several gas wells were drilled on a small structure between Carlinville and Gillespie[7] in which gas production had been found in 1909 and 1913 but had not been used commercially. The wells are small, the largest having an initial open flow capacity of 1¼ million cubic feet, but the gas sand is found at 375 to 425 feet, depending on the surface elevation, so that the investment required to drill a well is small. One company controls most of the acreage, so development should be orderly.

MORGAN COUNTY

In an endeavor to extend the old shallow gas-fields and to discover new ones, 34 tests were drilled east of Jacksonville in 1929 and 1930, of which 18 yielded commercial quantities of gas. A new producing horizon consisting of a black shale associated with a coal seam near the base of the Pennsylvanian strata was discovered at depths of 250 to 300 feet. The old producing horizons in the area are reported to be sandstones and limestones, also at shallow depths. The areas of gas production so far obtained in Morgan County are irregularly shaped patches scattered over more than a township. The Pennsylvanian strata dip gently to the east and no definite relation has yet been found between the gas-producing areas and structure. Opportunities for further development appear good and if the wells prove as long-lived as wells in the shale-gas fields of eastern Kansas they should supply gas for municipal and industrial use for a number of years.

MARION COUNTY

In 1930 a well in the NE. ¼ NE. ¼ sec. 4, T. 1 N., R. 1 E., about a quarter of a mile northwest of the Kuester pool and half a mile north of the Langewisch pool, northeast of Centralia,[8] was brought in and pumped 16

[6] Mylius, L. A., A restudy of the Staunton gas pool, Illinois State Geol. Survey Bull. 44A, pp. 18 and 20, 1918.

[7] Lee, Wallace, Oil and gas in the Gillespie and Mt. Olive quadrangles, Illinois State Geol. Survey Bull. 31, p. 71, 1915.
Lee, Wallace, U. S. Geol. Survey Geol. Atlas, Gillispie-Mt. Olive folio (No. 220), 1926.

[8] Bell, A. H., Oil investigations in the Centralia area,—preliminary report, Illinois State Geol. Survey Illinois Petroleum No. 4, pp. 6-12, 1926.
Bell, A. H., Structure of Centralia and Sandoval oil fields, Illinois, Illinois State Geol. Survey Illinois Petroleum No. 10, 1927.

barrels per day for the first three months. The producing sand in this well is in the lower part of the Chester series and is correlated with the producing sand of the Langewisch pool but not with that of the Kuester pool.

Southeastern Illinois

CLARK COUNTY

Less drilling was done in Clark County in 1929 and 1930 than in any of the other counties of the southeastern field. All of it was in old producing areas and to old producing sands. Some light wells were brought in at depths below 1000 feet, of which several were soon abandoned. A few wildcat wells were drilled, mainly to the east of the field, but all were dry holes. One of them, near the north line of the county and southwest of Oliver, was drilled to a depth of 1200 feet.

CRAWFORD COUNTY

There was considerable drilling activity in Crawford County throughout 1929, most of it in the Eaton-Porterville area and near the southern edge of the county along Embarrass River. Near Porterville, production was extended about a mile to the west into sec. 2, T. 7 N., R. 13 W., and sec. 35, T. 8 N., R. 13 W., where several wells were brought in, of which one had an estimated initial production of 50 barrels of oil per day. Another extension of production or the possible discovery of a new local pool was made in sec. 13, T. 8 N., R. 13 W., half a mile east of Annapolis, about half a mile north of the edge of the main Crawford County field. The initial production of this well was reported to be 45 barrels. This discovery led to the drilling of several additional wells in the vicinity, of which some yielded small quantities of oil.

Several small oil and gas wells, producing from the Kirkwood sand (Upper Mississippian), were brought in, in the Embarrass River bottoms in the southwest part of the county in 1929. The higher sands were barren and several carried water. One well drilled to the McClosky sand (Lower Mississippian) was dry, although the sand was structurally high.

In 1930, production was extended in an area about four miles east of Flat Rock, in secs. 2 and 3, T. 5 N., R. 11 W., (Montgomery Township), where several wells were completed. The crude oil is of good quality, near 34 A. P. I. gravity. The producing horizon is near the base of the Pennsylvanian formation and is probably correlated with the Robinson sand. The nearest old production lies one and a quarter miles to the south in the Birds Pool.

LAWRENCE COUNTY

Most of the drilling in Lawrence County in 1929 and 1930 was in the old producing areas and some good wells resulted. In the Embarrass River

bottoms north of Bridgeport a few wells were drilled but the production proved to be spotty.

Some good wells were obtained in the southern part of the county, particularly in Dennison township. In 1929 the McClosky sand was tested in several wells, and although the production obtained was small, the oil had a high gravity and was associated with wet gas, a characteristic of McClosky production elsewhere. In 1930 most of the new production was obtained in the Ridgely and Kirkwood sands. Some production was discovered in stray sands at depths of 350 to 750 feet. One of the wells in the stray sands produced 650 barrels of oil in the first three days, but production declined rapidly. Other features unfavorable to the exploitation of these sands are their small areal extent, the low gravity of the oil, and the great amount of steaming which the oil consequently requires before it is accepted for pipeline transmission.

The Shell Petroleum Corporation drilled several tests in the eastern part of the county, in the vicinity of Russelville, for the purpose of determining structural conditions.

Three wildcat tests, all dry holes, were drilled in 1929 and 1930. One of them is located in sec. 6, T. 4 N., R. 12 W., about one mile distant from old productive areas to the northeast and southeast, another in sec. 23, T. 2 N., R. 12 W., in the gap between the Lawrence County field and the Allendale field in Wabash County, and the third in the Russelville area in which structure tests had previously been drilled.

WABASH COUNTY

Activity was brisk during most of 1929 when a number of fair wells were brought in but decreased in 1930 (Tables 3 and 4). The extremely spotty character of Wabash County production was further demonstrated by the new wells. Some of them are exceptionally good, one of them, for example, producing an average of 85 barrels a day for more than three months. Of the total number of wells drilled in the Allendale field about one-half were dry holes, which is a higher proportion than in the other counties of the southeastern field but not unusual in Wabash County.

The best wells drilled in 1930 are located in the oldest producing area, secs. 9 and 10, T. 4 N., R. 12 W. One well produced more than 100 barrels a day for two weeks and an offset to it produced 85 barrels a day for about the same period of time after completion. Six new wells were completed in the NE. ¼ of sec. 15, T. 1 N., R. 12 W., northeast of the Adams Corner pool, extending production about a half mile to the northeast. The initial productions were only ordinary, but the wells have settled to a fair, steady production.

Scattered Wildcat Wells

Most of the scattered wildcat wells in Illinois completed or begun in 1929 and 1930 were located in the southern half of the State (Table 3). With few exceptions they were not located on known favorable structures. Some of the more important are as follows:

County	Pt. of sec.	sec.	T.	R.	Company	Farm	No.	Total depth
Jasper	NE. SE. NE.	6	6N.	10E.	Federal Royalty	C. F. Ross	1	2002
Cumberland	NE. SW.	14	9N.	10E.	Petroleum Exploration	McFarlin	1	1532
Saline	NW. NE.	11	9S.	5E.	Wheatley et al.	Puckett	1	1710
Jefferson	SE. SW.	24	4S.	2E.	Nason et al.	Woelful	1	2400
Effingham	SW. SW. NW.	16	8N.	7E.	Kremer and Tilford	Ordner	1	2002

A test well in Kankakee County (northeastern Illinois) drilled to the notable depth of 5045 feet was started in July, 1930, and completed in January, 1931. The hole started in the Silurian ("Niagaran") limestone and at the bottom penetrated 2200 feet of Mt. Simon (Cambrian) sandstone, the lowest part of which was arkosic. This is far below any known oil or gas producing formation in the State.

Conclusion

In general, the petroleum industry in Illinois does not have an optimistic outlook for the immediate future. Proration, cut in crude-oil price, and declining wells combine to make some wells which otherwise would have been maintained for some time unprofitable to pump.

In spite of difficulties and handicaps the search for new production continues in Illinois. A large part of the State is still incompletely tested and there is little doubt that new pools await discovery. Geology and geophysics will no doubt become increasingly important in guiding future prospecting for oil and gas.

Table 2.—*Monthly petroleum production in Illinois for 1929 and 1930 and annual production, 1925-1930*

	1929[a] M. Bbls.	1930[b] M. Bbls.
January	508	486
February	455	476
March	603	528
April	457	508
May	552	537
June	517	509
July	561	527
August	572	520
September	532	405

October	566	425
November	506	375
December	490	403
1925		7,863
1926		7,760
1927		6,994
1928		6,462
1929		6,319
1930		5,699

[a] Swanson, E. B., World's Production of Crude Petroleum, 1929, U. S. Bureau of Mines Annual Petroleum Statement No. P69, Sept. 29, 1930.
[b] Swanson, E. B., World's Production of Crude Petroleum, 1930, U. S. Bureau of Mines Annual Petroleum Statement No. P75a, Feb. 16, 1931.

TABLE 3.—*Wells drilled in Illinois in 1929*

County	Total Completions	Oil	Gas	Dry	Initial production Oil (bbls.)	Initial production Gas (M. cu. ft.)
Clark	13	5	0	8	59	....
Clay	1	0	0	1	....	....
Clinton	1	0	0	1	....	....
Crawford	53	41	2	10	549	....
Hamilton	1	0	0	1	....	....
Jasper	1	0	0	1	....	....
Jefferson	0	0	0	0	....	....
Jersey	0	0	0	0	....	....
Lawrence	27	19	0	8	1,226	....
Macoupin	1	0	0	1	....	....
Madison	0	0	0	0	....	....
Monroe	2	0	0	2	....	....
Morgan	29	0	15	14	....	4,588
Randolph	1	0	0	1	....	....
Saline	3	1	0	2	80	....
St. Clair	252	224	1	27	13,130	....
Scott	1	0	0	0	....	....
Wabash	47	23	0	24	976	....
Williamson	0	0	0	0	....	....
Total	433	313	18	101	16,030	4,588

TABLE 4.—*Wells drilled in Illinois in 1930*[a]

County	Completions	Oil	Gas	Dry	Initial production Oil (bbls.)	Initial production Gas (M. cu. ft.)
Adams	1	0	0	1	0	0
Bond	3	0	2	1	0	2,000
Clark	8	4	0	4	9	0
Clinton	2	0	0	2	0	0
Crawford	58	38	1	19	509	20
Cumberland	2	1	0	1	1	0
Edgar	1	1	0	0	1	0

Effingham	1	0	0	1	0	0
Gallatin	1	0	0	1	0	0
Hancock	1	0	0	1	0	0
Henderson	1	0	0	1	0	0
Jasper	1	0	0	1	0	0
Jefferson	1	0	0	1	0	0
Jersey	1	0	0	1	0	0
Kane	1	0	0	1	0	0
Lawrence	22	11	0	11	516	0
Logan	1	0	0	1	0	0
McDonough	4	2	0	2	3	0
Macon	1	0	0	1	0	0
Macoupin	15	2	5	8	24	4,590
Madison	5	2	2	1	22	?
Marion	2	2	0	0	16	0
Monroe	8	1	0	7	16	0
Montgomery	1	0	0	1	0	0
Morgan	5	0	3	2	0	1,597
Peoria	1	0	0	1	0	0
Perry	1	0	0	1	0	0
Pope	1	0	0	1	0	0
Randolph	5	0	0	5	0	0
Richland	1	0	0	1	0	0
Saline	1	0	0	1	0	0
Scott	2	0	0	2	0	0
Shelby	1	0	0	1	0	0
St. Clair	55	34	0	21	1,516	0
Wabash	36	22	1	13	501	35
Washington	1	0	0	1	0	0
Woodford	1	0	0	1	0	0
Total 1930	253	120	14	119	3,134	8,242
Total 1929	433	313	18	101	16,030	4,588

[a] Compiled from monthly reports published in the Oil and Gas Journal, supplemented by data obtained by the Illinois State Geological Survey.

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